9 Business Intelligence in Medium-sized companies: experience from successful Bi4dynamics solution projects

9.1 Overview

Business Intelligence (BI), a concept which emerged in the 1990s, became over the years more mature, elaborated, but also diversified. Derived from the basic concepts of Management Information Systems (MIS) and combined with Decision Supports Systems (DSS), it appeared for a short period of time as the Executive Information Systems (EIS) [1]. When the concept of data warehouses (DW) were developed and on-line analytical concepts (OLAP) became popular, the domain of BI gained importance. BI has, as do all information systems, two sides. One of them is technology side which defines the structure and technologies used. It deals with the data warehouse as the central point of BI to which data have to be collected through sophisticated processes of ETL (Extraction – Transformation- Loading) which connects business information solutions at an operational level with the data warehouse.

This transfer of data in the past was very batch-oriented with certain delays; it became faster with less delays than recently and is nearly on-line or even fully on-line in some solutions. Once data are in the data warehouse, they have to be formatted and disseminated to managers. At this point, companies can use different technologies from the broad group of OLAP tools. All this technological diversity has to be integrated by the company that wants to build such a system.

BI also has another side. Because BI is about reporting, analysis and decision support, it can be also observed from the user side – from the business side. At the beginning, these viewpoints have been somewhat neglected and the technology side was more important. But when BI became mature, in-depth research on its quality of support that was provided for managers emerged. Questions about the Business Value of BI occur more and more often. Howson defines seven areas of the Business Value of BI [2]:

- BI for management and control;
- BI for improving business performance;
- Operational BI;
- BI for process improvement;
- BI for improve customer service;
- BI for discovering new business opportunities;
- BI for government and public services.

This definition implies that BI became, even if the same technologies are used, more diversified and elaborated. The term BI maturity, the research area of several researchers [3], is explained in the literature by several models. It is very often used in the Six-stage BI maturity model by TDWI [4] which delimits six stages and defines for each one its own structural characteristics, analytics ability and focus of the stage. According to that model an up-to-date BI system is in its Adult (fifth) stage, and where the Enterprise DW is used, dashboards and cascading scorecards are implemented; the focus of the BI systems is not only in insight but more in support for action. BI systems are moving toward six stages of the aforementioned model where structure can be described as analytical services and as imbedded BI.

When a system is mature, leveraging the system becomes a crucial question for an organization. So it is not surprising that more and more research on BI is recently focused on the acceptance of BI by its users (namely managers). The Technology Acceptance Model (TAM)
developed by Davies [5], [6] was used by many researchers whose works focused on the phenomena of Information Systems acceptance. It was adapted several times for diverse types of Information Solutions. Sternad et al. [7] developed the extended TAM for Enterprise resource planning (ERP) solutions called ERPAM. TAM could also be the framework for researching the acceptance of BI [8].

9.2 ERP solutions in medium-sized companies

Our experience shows that BI in medium-sized companies has its own characteristics concerning strategic development and its use in terms of business value for the company. Being mature and more sophisticated, BI requires different strategies based on how it should be implemented as a successful support for managers creating and adding value to the business and to the company.

According to our experience, companies usually choose one of following two strategies:

- Use of ERP business solutions at the operational (transaction) level and its own, on the basis of OLAP based tools for building BI systems;
- Use of ERP business solutions at the operational (transaction) level and the use of BI modules provided by the ERP vendor.

Some companies adapt a hybrid strategy where they use OLAP tools for BI as well as BI modules provided by the ERP vendor (see also Drelichowski [9]). This strategy tends to be presented in large companies while more and more small and medium-sized companies simply adopt BI modules provided by the ERP vendor. It is, on the basis of our experience, because of their limited knowledge about OLAP tools and the lack of their own IT/IS specialists. On the other hand, another reason is that their business process is not sophisticated to the level to use OLAP tools, which would enable them to develop functionalities not implemented in the BI modules by ERP vendors.

ERP vendors started to imbed BI several years ago under the label of Executive Information Systems (i.e. SAP as SAP-EIS) [1]. Recently, nearly all of them offer one or even more BI modules within their ERP systems. Such BI systems are referred to as ERP add-ons or as Bradford stated, as ‘bolt-ons’ [10]. We are persuaded that the use of BI modules provided by ERP vendors is a very feasible scenario for medium-sized companies, which are flat organizations and, therefore, the border between BI reporting, focused on higher level managers and reporting at an operational level (operational BI) supported by ERP solution, is vague or even very invisible. This argument favors the use of ERP BI modules in medium-sized companies.

In the past, several research studies have been conducted on ERP solutions in companies. Abeerden’s [11] [12] research shows how companies use different add-on modules of ERP solutions and how the best-in-class companies differ from average companies (Table 9.1). We can see that BI modules are the most often used ‘bolt-on’ modules, which are used in ERP solution environments. After BI modules, there are CRM modules which also partly cover BI functionality.
Table 9.2.1 Add-on modules of ERP solutions

<table>
<thead>
<tr>
<th>Solution</th>
<th>2008I</th>
<th>2009II</th>
<th>x-ERP in % between 2008 and 2009III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Intelligence (BI)</td>
<td>41%</td>
<td>27%</td>
<td>46% 30% 18%</td>
</tr>
<tr>
<td>Contact Center Management</td>
<td>25%</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Customer Relationship Management (CRM)</td>
<td>37%</td>
<td>25%</td>
<td>43% 31% 20%</td>
</tr>
<tr>
<td>Document Management</td>
<td>35%</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Enterprise Asset Management (EAM)</td>
<td>19%</td>
<td>9%</td>
<td>25% 11% 30%</td>
</tr>
<tr>
<td>Enterprise Manufacturing Intelligence (EMI)</td>
<td>19%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Field Service Management</td>
<td>17%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Financial Planning &amp; Budgeting</td>
<td>35%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Human Capital Management (HCM)</td>
<td>19%</td>
<td>13%</td>
<td>29%</td>
</tr>
<tr>
<td>Manufacturing Execution Systems (MES)</td>
<td>28%</td>
<td>19%</td>
<td>26% 23% 15%</td>
</tr>
<tr>
<td>Product Lifecycle/Data Management (PLM/PDM)</td>
<td>24%</td>
<td>11%</td>
<td>25% 20% 29%</td>
</tr>
<tr>
<td>Project/Portfolio Management (PPM)</td>
<td>13%</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Quality Management System (QMS)</td>
<td>34%</td>
<td>22%</td>
<td>38% 27% 21%</td>
</tr>
<tr>
<td>Supply Chain Planning (SCP)</td>
<td>26%</td>
<td>11%</td>
<td>28% 18% 44%</td>
</tr>
<tr>
<td>Supplier Relationship Management (SRM)</td>
<td>20%</td>
<td>10%</td>
<td>30% 12% 29%</td>
</tr>
<tr>
<td>Transportation Management System (TMS)</td>
<td>17%</td>
<td>7%</td>
<td>20% 12% 58%</td>
</tr>
<tr>
<td>Warehouse Management System (WMS)</td>
<td>40%</td>
<td>20%</td>
<td>39% 19% 5%</td>
</tr>
</tbody>
</table>


The second reason why medium-sized companies use ERP BI modules, as a scenario for establishing BI concepts, is also because business processes in these kinds of companies are not as sophisticated as in big companies. They can be easily supported at an operational level by the usual ERP functionality and at the management level by ERP BI modules. Managers in medium-sized companies often do not have additional requirements which go beyond the usual functionality of the ERP BI module.

We have conducted two research studies concerning ERP solutions in companies in Slovenia. In the first one, we focused on ERP solution implementation in companies and in the second one, we researched ERP solutions use (acceptance) in their mature stage in the Slovenian companies. The first study [13] was conducted in 45 companies in Slovenia (Table 9.2).

Table 9.2.2 Distribution of organizations in the research sample by size and vendor

<table>
<thead>
<tr>
<th></th>
<th>SAP</th>
<th>Microsoft Dynamics NAV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small companies</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Medium-size companies</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Large companies</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>23</td>
</tr>
</tbody>
</table>

Source: Own research based on the Slovenian classification of organization size.
Research shows also that the majority of small and medium-sized companies use Microsoft Dynamics NAV, and that majority of these organizations have implemented the following modules: Financial Management, Sales and Marketing, Supply Chain Management and Warehouse Management. Concerning BI, the respondents answered that they use the reporting functionality of ERP solution modules. Reports generated by Microsoft Dynamics NAV are, according to respondents, suitable for operational BI as well as for higher levels of BI. Besides that, the respondents answered that Account Schedule Reports, Analysis by dimension and Detail report dimensions functionality of Microsoft Dynamics NAV have enough basic characteristics of OLAP. Some of them use add-on BI4Dynamics, which is described below and whose structure can be described as analytical services and as imbedded BI.

Our second research study was conducted in 44 companies in Slovenia [14] and was focused on the use of ERP solutions at their maturity phase. The 29 companies were Microsoft Dynamics NAV users, and 15 companies were SAP solution users. Survey respondents represented different groups of industries, including IT and telecommunications (44.0%); manufacturing (35.2%); professional, scientific and technical activities (10.2%); wholesale and retail trade (4.1%); and others (6.5%).

Respondents were 51.5% male and 48.5% female. Most people included (67.2%) had at least a high school diploma. 53.6% of the respondents have marked the work place as professional (experts etc.); 31.7% have marked low management (e.g. manager of group or organization unit); 12.6% have marked middle management (e.g. CIO); and, finally, 2% have marked corporate government and/or top management. The average working life reaches 15.4 years (min = 1, max = 43, SD = 10.2) and the average working life in these jobs extends to 7.6 years (min = 1, max = 37, SD = 7.4). The average respondent had used the ERP system for 4.7 years (NAV = 3.16 years and SAP = 5.56 years), a minimum 1 year and maximum 10 years for NAV solution, and 18 years for SAP solution in their daily work.

Respondents estimated their intensity of NAV/SAP usage via the following statement, “I would rate the intensity of my job-related NAV/SAP system use to be…” on a 7-point Likert scale, ranging from ‘not important’ to ‘very important’. The average value is 5 (NAV = 5.23 and SAP = 4.79), which means ‘a slightly greater importance’ than average. Most of respondents selected ‘6’, or ‘much greater importance’. Furthermore, the respondents estimated their frequency of NAV/SAP use via three statements proposed by Schwarz [15], also on a 7-point Likert scale. Responses to these questions are presented in Table 9.3. For all three statements, an average value for NAV solution is near 5, which represents an important degree of use and an average value for SAP solution is little below 4, which represents a moderate degree of use.

<table>
<thead>
<tr>
<th>In a typical one-month period, what is the likelihood of you …</th>
<th>Average NAVa</th>
<th>Average SAPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>… using most of features of the ERP solution?</td>
<td>4.51</td>
<td>3.71</td>
</tr>
<tr>
<td>… using more features of the ERP solutions than other users?</td>
<td>4.82</td>
<td>3.86</td>
</tr>
<tr>
<td>… using the more obscure aspects of the ERP solutions?</td>
<td>4.62</td>
<td>3.78</td>
</tr>
</tbody>
</table>

Note: Scale 1–7, ‘not important’ to ‘very important’.

We also asked respondents how they can confirm the statement, “The ERP system provides reports that seem to be exactly what I need.” on a 7-point Likert scale, ranging from ‘not important’ to ‘very important’. They confirmed the statement with a 5.08 (average), SD 1.40. In
addition, we conducted also several case research studies in medium-sized companies which showed that even if users are satisfied with reports provided by ERP solutions, either as operational BI or as BI for higher levels of management, they quite often also demanded beyond the pre-defined emerging reports. The companies solve this problem with the implementation of add-ons for BI with more complex analytical capability. BI4Dynamics solution as an add-on for Microsoft Dynamics has been used in several medium-sized companies.

9.3 Add-on BI solutions for ERP solutions – Example of BI4Dynamics solution and its environment

BI4Dynamics is a major add-on solution for Business Intelligence for Microsoft Dynamics AX and NAV [16], which provides rich business intelligence capabilities to companies of all sizes and from all industries. From the first day on, one can analyze the data quickly, accurately and make informed decisions. Business data from Microsoft Dynamics AX and NAV is processed in a BI4Dynamics data warehouse to provide new insights and to enhance performance. OLAP cubes and pre-defined Excel reports include rich KPIs and cover all AX and NAV application areas. The BI4Dynamics solution runs in a typical BI add-on solution environment for the ERP solution. To deliver BI content to end-users, the following processes have to be established in a company (Figure 9.1):

- Staging a database;
- Creating a data warehouse;
- Creating OLAP cubes;
- Performing business analyses.

Figure 9.3.1 Deliver BI content to the end-user process

Staging a database is the first step in which data are just copied from the source (ERP solution), and data staged in this step are not prepared to be analyzed. A staging database is a separate storage area created for the purpose of providing continuous access to application data. Data converters are written to access business data sources and then they will be cleansed and written into the staging database. It is updated daily with new or changed data from Microsoft Dynamics AX or Microsoft Dynamics NAV, so that the entire BI process takes less time.

The main function of a staging database is to provide data access for the BI process, but these structures are not optimized for analytics. This step is, in comparison with other steps, rather faster in the BI process as it contains only a copy function. In the second step, data structures are prepared in the data warehouse, but the data are still not fully prepared for analysis. A data warehouse is a place where data are stored for archival, analysis, and security purposes. During this step of the BI process, data are structured in a special “BI way”. Proper data warehouse is the key and most important part of a BI solution. Data in Microsoft Dynamics AX or in Microsoft Dynamics NAV are not made for analysis in matter of speed and analytical features so they need to be processed. This step is the most time-consuming in the BI process and depends on the
quantity of Microsoft Dynamics data. But pre-calculated data are a great benefit for end-customers, as the analysis could be done immediately.

In the data warehouse step, new data will be created and written to new database inside the SQL server. The main component of a data warehouse is a fact table, which is equal to a “super ledger” in Microsoft Dynamics AX or Microsoft Dynamics NAV. Simplified entries from Microsoft Dynamics AX or Microsoft Dynamics NAV are copied, processed and written to a fact table inside the data warehouse.

In the third step, data structures are fully optimized for Analytics through the building of OLAP cubes, multi-dimensional databases that are optimized for data warehouse. In OLAP cubes, data (measures) are categorized by dimensions and they are often pre-summarized across dimensions to drastically improve query time over relational databases. Dimensions are variables users want to track. For example, companies, dates, locations and other items, whose attributes are often non-numerical. Measurements are the quantities users want to measure, common measures are average, minimum and maximum of stock value or quantity and other items that can be quantified numerically. In this step, data from a data warehouse are copied and structured again. Now, a new database is created in SQL Analysis Services, which is also a part of the SQL server. Main components of the analysis database are OLAP Cubes. In BI4Dynamics, one OLAP cube is equals one application area (sales cube = sales area).

The fourth step, which is actually the final goal, are analytical services. OLAP delivers the simplest form of analysis, allowing anyone to ‘slice and dice’ interrelated subsets of data or “cubes” with the click of a mouse. Users can analyze data using standard OLAP features such as page-by, pivot, sort, filter and drill up/down to flip through a series of report views. OLAP analysis offers access to data warehouses and even more advanced analysis functionality required by power users and analysts. In this step, users connect to the OLAP cube with any front-end BI product. Most of BI4Dynamics customers use Excel as a front-end tool, as it is difficult to beat the affordability and Windows power based on products such as Excel. The analytical part of Excel is called Pivot table. As a whole process trying to standardize, BI4Dynamics offers also pre-defined Excel sheets for each application area.

9.4 The Challenge of BI for Small and Medium-sized Businesses using BI4Dynamics solution – Resources, Organization, and Gaining a Strategic Edge: Successful BI4Dynamics project cases

BI is still very often a synonym for expensive and complex solutions that require skilled IT professionals. The market is ruled by front-end vendors and BI service providers focused on the segment of large companies, not on small and medium-sized companies with their unique functional and organizational needs. Managers in medium-sized companies need better insight into their businesses and most of them would benefit from an affordable, easy-to-use BI solution that does not require demanding IT resources. Despite defining reporting as a basic need, managers of medium-sized companies rarely deal with the differentiation between a reporting tool and a BI solution, between ad-hoc analysis and static reporting.

Medium-sized companies cannot handle the BI domain the same way as big companies (the so-called enterprise segment) because of the costs and lack of internal resources. We think that the biggest differentiating factor regarding BI beyond management functional requirements is IT personnel. On this matter, a medium-sized company can deal with these problems in three ways. For some of these smaller businesses that completely lack IT resources, the main role in
developing a BI domain is completely outsourced to the ERP vendor which provides the ERP BI module and other resources needed.

Other medium-sized companies with some IT staff but without CIO have some capabilities to install and run BI solutions accordingly, but they lack the knowledge about the strategic issues of BI solutions implementation; in such cases, the counseling component is provided by ERP vendors regarding their solutions. Seldom does a medium-sized company have CIO, but if it does have one, BI is just another IT project. All these diversities are the reason that BI projects in medium-sized companies are different in approach, in scope and in responsibilities of ERP vendors and the company’s own IT staff.

9.4.1 PharmaSwiss SA

With 400 employees active in 14 countries, PharmaSwiss SA is a medium-sized pharmaceutical company, established in Switzerland in 2000. PharmaSwiss provides a full-service solution for multi-national pharmaceutical companies, whose strategic focus is elsewhere in the world. Having 14 companies running on different Microsoft Dynamics NAV installations, PharmaSwiss SA needed a complete business intelligence solution for consolidated sales analysis and profit and loss analysis.

The first project was a data warehouse for sales analysis and the standardization of monthly reporting. After deploying the standard BI4Dynamics solution, we added new attributes from customer and item cards into Microsoft Dynamics NAV. The next step was financial consolidation with the specific development of cost accounting keys for allocation of general ledger entries. The standard BI4Dynamics module was deployed with the additional module of Financial Schedules and was integrated with cost accounting, creating a solution that covered all the business financial needs.

The solution had a big impact on business users. Now spending minutes to prepare monthly reports and days in controlling department to analyze all the possible financial ledger entries, makes previous tasks of 20+ days a work of the past. “We understood that we need to focus on deploying a data warehouse as a foundation for all our analysis needs. Choosing to build a data warehouse from scratch or to use pre-defined models with pre-built integration procedures for our ERP system was an open issue for our company. After the 1-day pilot project of BI4Dynamics on our data, all questions were answered.” Barbara Košir, Chief Financial Officer

Now, PharmaSwiss SA has a corporate data warehouse with ETL process and OLAP cubes to quickly analyze data and focus on their business.

The next step is implementing a complete planning solution to focus on corporate performance management. This implementation process with the BI4Dynamics integration, with Microsoft PerformancePoint 2007 or Cognos, makes all future implementation possible.

9.4.2 Fragmat TIM

Fragmat Group consists of 7 factories for Styropor, two of them in Slovenia, the others abroad, and 2 factories for Bituminous hydro insulation materials. With intense investment in production equipment, they have opened new possibilities to increase sales in the markets of Southeast Europe and beyond. Fragmat has a clear vision of becoming a leading manufacturer of insulation material in Southeastern Europe.
After the implementation of Microsoft Dynamics NAV, the next step was to provide business users across the entire organization’s units with analytical solutions to standardize periodic reports and to provide an ad-hoc analysis capability. Because the group has multiple companies focused on production, there was a question of building a data warehouse and how to address the problem of Business Intelligence solutions. While the company was deciding how to start, the vendor proposed to give us 1 day to deploy the standard BI4Dynamics module on top of one of their companies. After basic training for the sales and finance departments, the business users noticed that the standard solution covered 90% of their needs. The IT department wanted to see the possibility of adding additional transactional sources for production quality, and after deploying the new module in a week’s time, Fragmat group had a running analytical system for sales, inventory, purchasing, receivables, payables, general ledger and manufacturing. The outcome was a fully-operational data warehouse with OLAP cubes and a desired front-end BI tool (Excel) within weeks’ time for a complete Fragmat group.

The results were described by business users as:
- Vast analytical possibilities;
- Most of the analysis in a very short period of time (seconds);
- We can do all the analysis by ourselves (easy to use);
- Very high added business value;
- We can focus on business and not on preparing data.

Goran Čop, the company’s CIO concluded, “We are very satisfied with the BI4Dynamics solution, because we have the possibility to analyze data very quickly and business users can make all of their analysis by themselves. It was very important for us to have the possibility to modify the existing data warehouse and to incorporate our additional sources for analysis. Nowadays, the Business Intelligence solution is a must and management should look at the added value it gives to the existing ERP system.”

9.4.3 Salonit Anhovo

Founded in 1921, Salonit Anhovo is a leading cement producer and the holding company for a group of businesses—successful subsidiaries in the Southeastern European building sector with more than 1,000 employees. After the successful implementation of the new ERP system – Microsoft Dynamics NAV, the next step was to implement a complete Business Intelligence solution. The first project issue was that every company needed their own data warehouse, because they had different types of production. Therefore, the next step was consolidating the financial view across all of their companies.

For every company, the vendor deployed the standard BI4Dynamics solution with our module for manufacturing analysis. The next step was the training of business users on how to make reports in the desired BI tool (Excel and Panorama). After the single company deployments, they implemented our data warehouse models for the general ledger and to account schedules on data from all companies. Because the holding company has companies in different countries, the vendor provides their localization module for BI4Dynamics, so that business users can analyze data in their native language. “We needed a consolidated view across all 17 of our companies and also business intelligence solution for every company, because we have different types of industries. After the first test implementation of the BI4Dynamics solution in one of our companies, we saw its potential and in a month’s time all our companies were benefitting from the
second time analysis. The flexibility of building reports by business users made our internal IT sector relieved about the routine data preparation”, stated Matej Markočič, CIO of the company.

Therefore, one corporate’s data warehouse and 17 data marts for every single company implemented in one month’s time show the true value of BI4Dynamics. There are currently 80+ users daily analyzing their business (sales, inventory, receivables, payables, production, etc.) and making reports in second time. The controlling department of the holding company now focuses on analyzing the consolidated general ledger through multiple dimensions and has the internal consolidation report completed in seconds.

9.5 Conclusions

Because BI is becoming more mature and because it has to be somewhat focused on its business value, it appears in companies in different scenarios. Medium-sized companies cannot deal with the BI domain in the same way as big companies because of the costs and lack of internal resources. More and more medium-sized companies decide to simply adopt BI modules provided by an ERP vendor to management support and to use ERP solutions’ reporting functionality for operational BI. This decision is based on the fact that business processes in medium-sized companies are not as sophisticated as in big companies, and their organizational structures are flat.

Our experience shows that BI in medium-sized companies has its own characteristics concerning the strategy development and it’s in terms of its business value for the company. In medium-sized companies, BI is very often used in a rather operational environment as operational BI. All these diversities show that BI projects in medium-sized companies are different from BI projects in large companies in terms of approach, scope and responsibilities of ERP vendors and the company’s own IT staff. Technical innovation – BI technologies for easy use in small companies – is only one aspect that will help increase BI’s prevalence in medium- (and small) sized companies. In discussing future plans with many of the case study medium-sized companies, much of their concern was not about technology, but rather, on one side in finding new ways to use BI to address common business problems and on the other side, to build (and to extend) the business value of existing BI systems.

Bibliography


